Piezo-Soliton Reactive Armor Featuring Cuprate-Based Piezoelectric Generation of Current Coupled with Photomagnetic Kinetic Counterforce Mechanism

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Introduction

Building upon a concept dating to 2022 (ibid.,) soliton waves associated with the PhOto-Magnetic Propulsion system may, in addition to be used to provide reactive structural reinforcement through mechanisms which utilize conventional pressure sensors to determine the appropriate magnitude and timing of counter-force pulses against simple copper plates, this publication conceptualizes a mechanism which could form the basis of a novel and practical armor for ships as well as aircraft which relies upon an altered mechanism relative to the 2022 publication intended for defense against high-explosive warheads rather than the sort of hazards mentioned in the 2022 publication sc. falling trees and other debris.

Abstract

While the basic concept of providing a kinetic counterforce against an impacting force using a counter-explosion (useful only for heavily armored vehicles such as tanks and one-time-use-only,) providing this force *from within the integument* of an object to be shielded with kinetic force stepped up in synchrony and in proportion with the impacting force is one which has not been explored except in a single publication from this author dating to 2022. PoMP systems, first conceptualized as a propulsive mechanism, open up new possibilities for reactive armor. When it comes to overpressure waves associated with high-explosive warheads and protecting assets such as ships or aircraft, the platforms to be protected often have little space for additional armor or equipment. Every square inch, in the case of aircraft, particularly, is allocated for some purpose or another. While it may be theoretically possible for an aircraft to carry a battery or APU-powered system for generating such counter-force pulses as envisioned in the 2022 publication, the amount of energy required would likely push a battery system beyond its limits for maximal rate of discharge.

The only source of energy sufficient to provide the needed energy to generate proportional counter-force is the overpressure wave, itself. Based upon this premise, it should be possible to leverage the piezo-electric effects of the interaction of the overpressure wave with the specialized armor in order to generate the electrical current necessary to power the optical element of the PoMP-based counterforce mechanism. A cuprate would need to be used as only a cuprate can react kinetically to soliton emissions with reliability.

The success of such an approach would hinge upon two primary factors: The first being the efficiency of the conversion of pressure into electrical energy

within the piezo-electric material and the second being the latency between the introduction of pressure by the explosive wave and the associated counter-force.

To address the problem of latency, a capacitant layer residing behind the light-generative (LED) layer, particularly in the case of aircraft i.e. they experience non-trivial drag due to atmosphere, could be used to make up the difference between the damaging force being exerted by the wave at any given moment and the strength of the counter-force soliton emissions. In the case of aircraft, a great deal of pressure is routinely exerted against the aircraft's integument as a result of drag with the atmosphere. If a mechanism were to be integrated in the integument of an aircraft designed to convert pressure into electricity, it would only be logical for it to be used to build up reserves of energy prior to activation in combat by taking advantage of the electrical potential provided by integument compression introduced by drag, itself.

Conclusion

Provided sufficient efficiency, an accidental byproduct of the design of such a system would be that aircraft equipped with such an armor technology, regardless of their mode of propulsion, would be able to overcome a high percentage of drag-induced slowing effects while traveling through atmosphere. If an aircraft integument was able to convert pressure energy into electrical energy in real-time and was designed to reflexively emit soliton energy toward a material known to respond to it kinetically in the opposite direction of the initial force, a natural consequence of this would be that the introduction of drag would result in a boost to propulsion (not entirely dissimilar from the concept of regenerative braking in battery-powered automobiles.) While we can never expect this conversion to be 100% efficient, if it were to reach an efficiency level sufficient to prevent substantial damage to an aircraft by an explosive warhead, it stands to reason that the pressure-to-energy conversion would, at that point, be sufficient to inadvertently provide supplementary propulsion to the craft. This is not surprising given that this is fundamentally an energy harvesting and conversion technology.

This technology would be desirable for use in missiles, as well, as the negation or partial negation of drag effects would enable missiles to achieve higher terminal velocities and greater range using the same quantity of chemical propellants. This would have application for armor-penetration (including armor based upon this very concept.) It may be possible that in a future conflict, missiles featuring piezo-soliton reactive armor may be used against targets equipped with the same armor technology. Interestingly, if the efficiency of energetic conversion exceeded a certain threshold in such a scenario, the result could be that two objects would be mutually deflected prior to a detonation. In other words, this technology may render extant weapons systems entirely obsolete. Practically speaking, the object with the shielding mechanism of superior efficiency would likely win out. Without sufficiently high efficiency and sufficiently low latency, however, such shielding may prove ineffective.

The presence of some degree of latency may prove a critical ingredient for success in this matter as piezo-electric processes often (but do not always) require that the exerted level of pressure be in flux in order for current to be generated. Materials which generate steady current from steady pressure, while extant, are in their infancy. Identifying a cuprate-based material with this attribute may prove challenging, although the benefits would justify any potential expenditures. This type of approach to armor technology makes plausible a scenario in which armor once again gains a position of preeminence over low-observable characteristics. While this armor technology would not be compatible with currently-fielded stealth technology, it would be compatible with the stealth technology described in publication 3 November 2023.

In naval applications, the implementation of high-explosive resistant armor of this type may help to preserve the feasibility of the use of large, high-value vessels such as aircraft carriers. While the current trend is toward the use of greater numbers of naval drones of smaller size and lower cost, a revolutionary improvement in armor technology could help to create a protective niche for the once-indispensable Supercarrier concept.